

AGING OF RADIOIODINE IN SOIL

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Aging of radionuclides in soils after deposition can play an important role in the change of the physicochemical form, which is an important factor in determining the fate of radionuclides in the environment. Iodine is an essential element for animals and humans. It is well known that iodine is needed for the synthesis of thyroid hormones and that iodine deficiency induces thyroid diseases. Radioiodine (including ^{129}I and ^{131}I) released from nuclear facilities is of special concern because of its high fission yield, volatility, transferability, and its ability to accumulate in the human thyroid. This work deals with the aging process of adsorption and the binding of radioiodine to the solid phase in soil as assessed by means of extraction methods and its chemical form in water extract was also determined. Volcanic ash soil (Andosol), a typical upland soil in Aomori, Japan, was collected from a grassland. Carrier-free $^{125}\text{I}^-$ or $^{125}\text{IO}_3^-$ was added to the soil samples, which were then stored in an artificial climate chamber, and wetting-and-drying treatments were repeated. Extractability of ^{125}I with water from 0 d to 120 d after the addition was measured, and the chemical forms of ^{125}I in the water extract at 2 and 29 d after the addition were also determined by using an anion exchange disk. Extractability of ^{125}I with 25 % tetramethylammonium hydroxide (TMAH), bound to organic fraction, at 29 d after the addition was measured. UV irradiation of the soil-water mixture sample at 30 and 120 d after the addition was used to gently extract ^{125}I bound to the soil organic matter. The extraction yield with water of ^{125}I , added as both I^- and IO_3^- forms, decreased with aging, and the chemical form in the water extracts at 29 d was predominantly I^- , even if the added form of iodine was different. The extraction yield of ^{125}I with 25 % TMAH was more than 90 %. The content of ^{125}I in the water irradiated with the UV light increased with the time period of the irradiation. The UV irradiation decomposed the solid organic matter in the soil and the dissolved organic matter was good correlation with the content of ^{125}I in the water extract. The data suggest that radioiodine deposited in the soil was gradually bound to the organic matter with aging. This work was conducted under contract with the Aomori Prefectural Government, Japan.